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June 8, 2018

Ex Parte

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, GN Docket No. 17-183

Dear Ms. Dortch:

On June 6, 2018, Scott Townley, Patrick Welsh, and Charla Rath of Verizon met with the Office of Engineering and Technology and Wireless Telecommunications Bureau staff listed in Attachment 1.

Verizon reiterated its conditional support for unlicensed use of the 5.925-6.425 GHz band, as long as the Commission adopts rules that protect the tens of thousands of existing microwave links and future microwave deployments in the band. The challenge of protecting this service is compounded by the importance of these links to public safety and critical infrastructure entities. In particular, Mr. Townley underscored some of the concerns other parties have raised with respect to the interference analysis submitted by RKF Engineering in support of unlicensed in this band.[1] We also suggested that the parties seeking unlicensed access to these frequencies should offer mitigation techniques. *See* Attachment 2.

Sincerely,

Attachments

[1] *See* RKF Engineering Services, "Frequency Sharing for Radio Local Area Networks in the 6 GHz Band" (Jan. 2018) *attached to* Ex Parte Letter from Apple, *et al*. to Marlene Dortch, FCC, GN Docket No. 17-183 (Jan. 25, 2018). *See* Ex Parte Letter from Stacey Black, AT&T, to Marlene Dortch, FCC, GN Docket No. 17-83 (Mar. 26, 2018); *see also* Ex Parte Letter from Counsel, Fixed Wireless Communications Coalition, to Marlene Dortch, FCC, GN Docket No. 17-183 (Mar. 13, 2018).

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Attachment 1

Office of Engineering and Technology
Julius Knapp
Bahman Badipour
Brian Butler
Martin Doczkat
Michael Ha
Kevin Holmes
Walter Johnston
Paul Murray
Nicholas Oros (via tele-conference)
Barbara Pavon (via tele-conference)
Jamison Prime
Ronald Repasi (via tele-conference)
Rodney Small (via tele-conference)

Wireless Telecommunications Bureau
Chris Andes (via tele-conference)
Peter Daronco (via tele-conference)
Thomas Derenge
Ariel Diamond
Blaise Scinto

Attachment 2

Methodology

- **The RKF study relies on “averages of averages” to hide the severity of the interference of uncontrolled RLANs to FS links**
- **Averaging smooths out variations that are the cause of harmful interference**
- **Ignores the relatively infrequent cases most likely to cause harmful interference**
  - Ex 1: Interference from high activity RLANs hidden. 9 out of 10 devices in the study are assumed to be of low activity that almost transmit nothing and hence cause no interference. The remaining 10% with high activity is assumed to transmit average hourly Mbytes using high speed in short time, so the study wrongly concludes that there is no interference most of the time even from the high activity devices. This example illustrates the flawed methodology where averaging is used to hide interference by making convenient assumptions. Also in practice there is consistent traffic over time for high activity traffic like streaming video rather than short bursts
  - Ex 2: Interference from high EIRP RLANs hidden. A mix of different EIRPs (low, medium, high) is considered in the study for different types of RLAN devices. Then averaging is used through randomization of EIRPs. Averaging of high EIRP RLANs along with low/medium EIRP devices blurs any interference observation that could be expected from such high EIRP devices. Rather than averaging of EIRPs, specific worst case scenarios need to be considered to evaluate interference.

Methodology

- **Interference studies should focus on specific local morphologies**
- **Consider Specific Interference Scenarios rather than CONUS wide study**
  - Interference study should consider specific local scenarios under realistic worst case assumptions rather than CONUS wide averaging.
  - Large scale statistical averaging across different categories (population demographics, device distribution, device types etc) hides real interference scenarios behind scenarios where interference is not an issue.
- **Need to identify Interference Scenarios for Co-existence solution**
  - Report claims that affected FS links are random in their simulation study. This assertion seems incorrect because FS links are fixed and basic technical understanding dictates that there must be a pattern to interference (including factors such as closeness of interferer, LOS, outdoor, density of interferers, high EIRP, outdoor etc) that need to be been identified.
  - Understanding scenarios/factors that cause potential interference would help find possible solution to co-existence of RLAN devices with FS links. The study falls short in this regard by overlooking interference scenarios.

Assumptions

- **Multi-story building distribution**
  - The 1/n probability distribution assumed ignores that fact that a building with n floors likely has n times the people (and therefore the RLANs)
  - Study dismisses interference from RLANs to FS receivers from RLANs situated on high floors, at close range, through a window, or other corner case geometries without any substantiation. The study arbitrarily makes assumption that there is no possibility of interference beyond 10 floors. This is unscientific and really turning a blind eye to where interference could be a problem
- **Population density assumptions**
  - Urban areas are apparently assumed to have a uniform population density of ~3300 pops/mi^2. In fact there are 133 incorporated places in the US with a population density (2010 census) of >10,000 pops/mi^2
  - Population density is highly localized and cannot be approached in an averaged fashion.

Assumptions

- **Neglects line-of-site propagation**
  - RKF model does not account for LOS cases. Note that 40 dB/decade *by definition* is NLOS. Compare the two pathloss profiles and note the tremendous difference:
    - NLOS: 150+40log(km)
    - LOS: 108+20log(km)
  - The 42 dB offset is typical of a heavily diffracted path in a highly urbanized environment. It is not typical for all paths, even within an urbanized area
- **Ignores 95% of US as "barren areas"**
  - Many 6 GHz FS links connect urban areas to outlying rural areas with a population center. These are not links that terminate where no-one lives
  - The 6 GHz band is the *only* band available for reliable links of over 10 miles
- **Ignores antenna size**
- **Ignores aggregate interference**
- **Ignores growth in FS deployment**
- **Minimizes outdoor deployment scenarios**

Mitigation

- **No Meaningful Mitigation Techniques**
  - Study underestimates interference to only 1% through averaging-of-averaging and claims that in these cases an improvement in fade margin could be achieved in a manner consistent with current operational practice
  - Study fails to provide any specific meaningful interference mitigation techniques. No specific mitigation required by RLANs to avoid interference to FS links

- **Need to coordinate RLAN deployment**
  - Prevents uncontrolled deployment
    - Location
    - Power
  - Interference mitigation and enforcement